PROJECT ZENITH - Robotics

It is impossible to learn that which one thinks one already knows

What can you expect to learn?

When we designed this course, we did not want to focus on any one domain in robotics. Instead, we wanted to give you an overall idea of how you can make your own robots. This course shall help students to taste various aspects of robotics including simulations, hardware*, coding and much more. You will primarily be working on simulating a robot which would be able to move around in an environment filled with obstacles. Unlike conventional simple hard coding, you will learn to control the robot using advanced control strategies. If you wish to build a real robot simultaneously and have access to the necessary components you can follow along with a video series where we will build the simulated robot*. The videos shall help you to get an idea of how to build a robot and interface various hardware components. The assignments consist of robot programming to achieve specific goals each week. In the end you will be able to put together a whole Obstacle Avoiding Robot.

Every week you will have to simulate scenes to understand the given theory and as each week passes by, you will be able to put together a whole project in robotics.

We are eager to teach you as well. Contact the team via Whatsapp or discord to help you out when in a pinch. Hoping to provide you with the best learning experience which could be given!

* Subject to terms and conditions

Syllabus

Week 1: Basic Robot models and Sensors.
Learn how to model a basic robot and about some general sensors used in mobile robots.
Assignment: Control a simple robot using Coppeliasim

Week 2: Basics of Control Theory and PID
Learn why we need control theory and how to implement control using PID controllers.
Assignment: Simple cruise controller using PID

Week 3: State Space Systems and Linearizations
How to model the robot as a state space system and how to linearize a non LTI system.
Assignment:

1. Linearize an unicycle model.
2. Simulate a simple go to goal behaviour using the unicycle model directly.

Week 4: Solution to LTI Systems, Stability
Learn to find the solution to LTI Systems and check for Stability.
Assignment:

1. Find the solution to the unicycle model.
2. Simulate an obstacle avoidance behaviour using state space form.

Week 5: Observability, Controllability.
Learn to check a system for observability and controllability.
Assignment: Check our system for observability and controllability.

Week 6: Hard Blending
Combine go to goal behaviour and obstacle avoidance behaviour
Assignment: Simulate a robot to navigate obstacles to reach a goal.

PERKS:

1. Get a project completion certificate if you complete all assignments successfully.
2. Hands on learning experience.
3. Senior Contacts.
4. A resume worthy project.